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ABSTRACT

According to traditional measures, the productivity of the American worker has declined. If education's contribution to economic productivity is to be improrant in this decade, the measures need better definition. Technology has affected our perception of how much education is required to keep pace with growth. Those who believe there is a shortage of job-specific skills want more vocational education in the schools; others, who see vocational education as a way of narrowing student competencies and lowering expectations, stress that schools' first priority should be the teaching of a core of skills. In the 1980's there has been an increase of workers holding jobs for which they are overeducated. Gains in educational equity have not produced economic equity, making the problem a concern of the workplace, not the classroom. It is evident that productivity increases as workers participate in decision-making at work. It is also becoming more apparent that the most productive workers may be those with broad educational backgrounds, yet math and science skills have declined and foreign language and international studies have been neglected. The skills needed for the evolving information society call for general training in addition to job-specific training. The challenge to educators is to meet the current needs through evaluation of the type of curriculum that best prepares students for the range of tasks the future will require. Most important in concentrating on individual productivity is maintaining a sense of balance in educational programs between job-specific training and general training. (MD)

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The Contribution of Education to Economic Productivity

Schooling in a Technological Society

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Clearinghouse on Educational Management
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The Contribution of Education to Economic Productivity

Schooling in a Technological Society

Wynn De Bevoise

Clearinghouse on Educational Management
College of Education
University of Oregon
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Since its establishment in 1964, CEPM has provided international leadership in the field of educational administration. Researchers from the disciplines of education, political science, sociology, management, economics, and law bring their diverse perspectives to the Center's efforts to improve schooling through better management of human resources.

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Preface

The ERIC Clearinghouse on Educational Management is pleased to add to its state-of-the-knowledge series this monograph on education and economic productivity. The purpose of this series is to provide thorough summaries and syntheses of knowledge in critical topics related to educational management.

We are indebted to Wynn De Bevoise for her thoughtful analysis of the literature and lucid presentation of the issues attending this complex topic. At the time the monograph was written, De Bevoise was serving as a research analyst for the ERIC Clearinghouse on Educational Management and as editor for the Center for Educational Policy and Management. Her work was thus supported by both organizations. She is now employed full time by CEPM as its coordinator of publications.

Philip K. Piele
Professor and Director
ERIC Clearinghouse on
Educational Management

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Other helpful suggestions were offered by C.H. Edson, associate professor of education in the Division of Educational Policy and Management at the University of Oregon. Edwin Dean of the National Institute of Education, also furnished valuable materials. Philip K. Piele, director of the ERIC Clearinghouse on Educational Management; Stuart Smith, assistant director of the Clearinghouse; and Robert H. Mattson, director of the Center for Educational Policy and Management provided encouragement and support throughout the preparation of this manuscript. Finally, I wish to thank Linda Lumsden for her competence in helping to secure materials and manage the production of several unwieldy drafts until a final product was realized.

Foreword

Most people believe that education increases the productivity of individuals at work and that the rising educational attainments of American workers over the last fifty years have contributed significantly to the growing economic prosperity of the United States. These beliefs have been substantiated by economic theory as well as empirical studies.

Yet developments over the last ten years have raised questions about the seemingly direct and straightforward relationship between education and economic productivity. Since 1973 the productivity of the American work force—the amount of economic output produced per each worker—has declined in many industries and has remained essentially unchanged for the economy as a whole. At the same time, the average education level of the American work force has continued to increase. By 1980 more than 25 percent of all young workers entering the labor market had completed four or more years of college. Yet many were forced to accept jobs incommensurate with their level of training.

There have also been theoretical challenges to conventional views of the relationship between education and productivity. Education may indeed increase the skill levels of workers, but the opportunity to use those skills in the workplace and to be rewarded for their use depends on factors outside an individual's control. It depends on the jobs available in the market and the prerogatives of employers to fully utilize their workers' skills and abilities.

In this paper, Wynn De Bevoise discusses the conventional views about the relationship between education and work as well as some of the recent challenges to these views. She then reviews some of the major issues surrounding this topic, including the impact of technology on the skill requirements of jobs and the growing discrepancy between the educational skills of workers and the skill requirements of their jobs, what some have called overeducation. Throughout the discussion De Bevoise draws implications for education.

De Bevoise has succeeded in taking a complex subject and presenting some of the basic issues in a clear and straightforward manner. Thus this paper provides a good introduction for educators, researchers, and other readers who may be interested in and concerned about the topic of educa-

tion and productivity, but who may not be familiar with some of the challenges and complexities surrounding it.

Russell W. Rumberger
Senior Research Associate
Institute for Research on
Educational Finance & Governance
Stanford University

Introduction

Mention the words "education" and "productivity" in one breath and the humanist is apt to flinch while the supply-sider visibly brightens. The two contrasting responses stem from very different perceptions of the purposes and proper emphases of education. The humanist might ask how the educational system serves the whole person by imparting, in the words of Ted Mills, "a taste of human wisdom, an understanding of inner human needs, the meaning of self-worth." The economist might be more concerned about the extent to which our educational system trains students for the world of work and how successfully it does so.

Aside from this philosophical split, which will certainly not be resolved here, the relationship between education and economic productivity is a formidable topic, not only because of a wide-ranging literature that covers the disciplines of education, economics, sociology, psychology, and political science, but also because of the uncertainty about ways to measure productivity and quality of education. This monograph seeks to demystify the production functions and theoretical models of social scientists to give a summary of the inquiry into education and productivity thus far. It offers educators and administrators alternative views on the relationship between the two and suggests possibilities for improving the contribution of education to our national economic well-being.

The first section of the monograph assesses the reasons for current attention to the topic of productivity in the United States. It then explores measures of productivity and the evolving interest in education's contribution to productivity. Traditional measures used to reflect the contribution of education to productivity are generally incomplete and open to different interpretations, a problem that serves to complicate an already perplexing topic.

Advancing technology and its uses have major implications for education and productivity. If a sufficient number of workers do not understand how to operate and maintain modern machinery, productivity will fall. Moreover, we depend upon the educational system to produce highly skilled technicians capable of designing the complex tools of technology. Two different interpretations of the shift in skill levels and requirements as a result of technology suggest the controversy and lack of consensus attending this study. Technology, according to some researchers,

contributes to the deskilling of jobs. Others contend that technology increases the level of skills required. A careful assessment of the skills employers and educators are identifying as requisite for our rapidly changing society yields implications for curriculur design, particularly at the secondary level.

The third section treats the problem of overeducation, most notably at the college level, and considers the possible consequences of overeducation on worker productivity and job satisfaction. Differing views on access to higher education, the provision of alternative forms of postsecondary education, and ways to improve utilization of workers' skills on the job provide some possible answers to the problem.

Current needs related to productivity that have implications for education are identified in the fourth section. They include the need for better training in science and math and in foreign languages and international studies. Many educational planners see incorporation of more course requirements in these subject areas into a core curriculum as one way to improve the technical and cultural literacy of all students.

The concluding section reviews the implications of research on education and productivity. Reforms in both the classroom and the workplace suggest avenues for increasing the productivity of graduates from our system of education while maintaining a balanced view of human and economic needs. Despite differences in methodology and interpretation, the literature does confirm that human resources, particularly knowledge, are essential determinants of economic productivity. Thus the allocation of resources to education and the support offered to public education in particular will have a significant impact on future economic growth through the development of technology and improved use of natural and human resources.

1. Productivity and Its Measures

American businessmen, government officials, and educators share an acute concern over the apparent decline in national productivity in recent years. Educators share the concern because of the demonstrated relationship between education and productivity. The educational system was lauded in the 1960s for bringing about increased productivity, but it is castigated by many today for failing, after receiving unprecedented amounts of federal aid, to help maintain that level of growth throughout the late 1970s and into the early 1980s.

Increasing the American concern over losses in productivity are the apparently steady economic gains being made in Japan and West Germany. In recent years, American businesses and schools have studied their Japanese counterparts to find ways of boosting productivity. Japanese management techniques—including establishment of quality circles, in which workers and management as equals hold regular meetings and discuss product quality and working conditions—have been adopted in some American companies. In the educational sphere, the Japanese emphasis on science and math is considered one of the reasons Japanese technology is surpassing American technology in certain fields. Several bills to improve science education are currently under review in Congress as part of an attempt to remedy inadequacies in the supply of science teachers and graduates.

Concurrent with the slowdown in economic growth in the United States is a perceived deterioration in the quality of education. One measure of quality, though not by any means accepted by all as a reliable indicator, is the nationwide average of scores on the verbal and mathematics sections of the Scholastic Aptitude Test (S.A.T.). In 1982, the averages for both sections of the S.A.T. rose slightly for the first time in twenty years. The preceding nineteen-year decline in scores, coupled with complaints by

employers and colleges that many high school graduates are functionally illiterate, has provided a convincing argument that the American educational system is no longer effectively meeting its goals. Proponents of the system point out the inadequacy of S.A.T. scores as a sole measure of educational quality as well as the gains achieved in making education in the United States more accessible at all levels to those who were previously ignored or excluded.

Changes in technology have also engendered concern about the skills presently available in the labor force. A recent article in *Newsweek* stated a widely held opinion: " New jobs are rising in the service and high-tech industries—jobs that require skills that many workers simply do not possess." The article does not specify what these skills might be; generally, assertions in the media about skill requirements for the new technological age are vague. If schools are to continue contributing to national economic health, a careful and accurate identification of the skills requisite for future work should be a first priority.

Measures of Productivity

What is productivity and how is it measured? Just as there are copious and contradictory views of the purposes of education and measures of its effectiveness, there are also different perceptions of what it means to be productive and how productivity can be expressed quantitatively.

To the economist, productivity indicates the amount of work the labor force is able to accomplish in terms of goods and services. In order to measure this type of productivity, some researchers evaluate increases and decreases in the Gross National Product (GNP) and compare the United States' GNP to those of other industrialized countries. A common measure of worker productivity is obtained by dividing the output of goods and services by the number of reported employee hours.

Since 1973, disturbing fluctuations in the GNP and a steady decline in productivity growth as reflected in output per employee hour have led to increased concern about the United States' economic health and ability to compete in the international marketplace. In the May 1982 issue of the *Monthly Labor Review*, Arthur S. Herman reported that in 1980 productivity as measured by output per employee hour had declined in over half of the industries regularly indexed by the U.S. Bureau of Labor Statistics. In the five-year period from 1975 to 1980, over three-fourths of the reported industries showed a slowdown in productivity.

Not everyone, however, agrees that we are experiencing an alarming

decline. In a recent article for *Scientific American,* Eli Ginzberg questions the prevailing interpretations of available data. He argues that on a per capita basis the United States is close to its long-term trend in its gross domestic product and that the apparent rate of productivity decline may be influenced by an overstatement of the actual hours worked, the shift from a goods to a services economy, and the failure of current statistics to reflect changes in quality, investment in the public sector, and activity in the "underground" economy and in the household. He concludes:

> If one were to understand and take proper account of these developments, the performance of the U.S. economy would probably be better, and possibly much better, than the current statistics suggest. Americans may well be unduly worried over a phenomenon that reveals more about the limitations of economic analysis and statistical reporting than about the economy itself (p. 70).

Ginzberg's opinion that present measures of productivity in service industries may be inadequate is supported by Jerome A. Mark of the Bureau of Labor Statistics, who recently reported on the Bureau's ongoing efforts to improve such measures. He sees improvement in some industries, such as transportation and finance, but remarks that "there are severe conceptual as well as data problems in measuring productivity in such industries as educational services and social services and in the important field of medical services, and progress in these areas is expected to be much slower."

The more recent equations for measuring productivity, including those used by the Bureau of Labor Statistics, try to include factors in addition to employee hours that can be considered "inputs" into the production process. Capital improvements, investment in research and development, and training and education costs are those most commonly used.

Some social scientists studying productivity measure it in terms of status and earnings. Based on assumptions about the operation of free markets under competitive conditions, their research assumes that those workers who are most productive are assumed to hold more responsible positions and receive higher salaries than do less productive workers. In this case productivity might be defined as either the ability to produce more or to accomplish work of a higher quality than the average. Several studies have linked educational levels to salaries to show that workers with more education earn more and are more productive. These findings, however, have been challenged, creating a controversy that will be more fully discussed in the following section.

Since the measures described so far rely on aggregated data that fail to consider many of the influences on productivity—managerial, effec-

tiveness, technology, structure of the economy, attitudes and behavior of workers, product quality, and business fluctuations—it is hard to assess how accurately they describe reality. An ideal measure would incorporate at least quality and quantity of a worker's product, but in the services sector of the economy even these factors are frequently elusive.

One of the few studies attempting to relate worker characteristics directly to their level of productivity, conducted in the midseventies by Stanley Horowitz and Allan Sherman, serves to illustrate the diverse ways in which productivity can be expressed. Horowitz and Sherman used the operational availability of ships in the U.S. Navy as a measure of productivity. By evaluating the ability of particular crews on each ship (those responsible for the boilers, engines, gun systems, missile systems, antisubmarine warfare systems, or sonars) to keep their equipment in operational order, and by then correlating the results with the personal characteristics of the workers, the researchers were able to draw very specific conclusions. They found that, for all but one occupation, length of service related positively to productivity; that, for sonar technicians, sea duty was the only experience to increase productivity; and that, for the most technical positions, graduation from high school increased productivity but made no difference in less skilled occupations.

While aggregated data on gross measures of productivity may be useful for indicating trends, they do not lend themselves to the type of analysis possible in Horowitz and Sherman's study. It would seem that if we are to learn anything very useful about the contribution of education to productivity, analysis will need to be made at the level of ships' crews as well as at the level of the Gross National Product.

Approaches to the Economics of Education

Interest in the economic aspects of education, in terms of consumption and investment, is frequently traced back to Adam Smith, who suggested that a man's entrance into productive employment may be dependent on his prior acquisition of basic knowledge and skills. During the Industrial Revolution, however, attention frequently focused on the gains in productivity made possible by new machinery rather than by expanded educational opportunities.

Human Capitalism

In the 1960s a series of studies emerged suggesting that much of the economic growth America had enjoyed in the first half of the twentieth

century was due to increases in human capital—the development and expansion of knowledge, skills, and problem-solving abilities in workers—rather than to investment in physical capital. This view, variously referred to as the neoclassical or human capitalist approach, has been supported by the work of Edward Denison, Theodore Schultz, Gary Becker, Jacob Mincer, and others. These researchers have related increased productivity on a national level to higher levels of education. They have also argued that higher levels of education increase salaries and rates of return to both society and individuals when compared to other social and individual investments. Thus human capital theory shifts the emphasis on investment and rates of return from machinery to people.

Some early followers of human capitalism believed that for each increase in spending for education there would be a corresponding increase in economic growth. Although developments in the last decade seem to contradict the assumed correspondence between educational expenditure and economic growth, many theorists still hold to the basic tenets of human capitalism. In seeking maximum profits, employers, it is argued, will use the skills of workers efficiently to complement the investment in physical capital and facilitate adaptation to technological change. Despite changes in the economy, these theorists contend, higher skills, reflected in higher levels of education, will be increasingly in demand to keep pace with new technology, and highly skilled workers will continue to be financially rewarded for their investments in education.

Alternative Approaches

The work of the human capitalist or neoclassical economists has been contradicted in other quarters. Harry Braverman, Samuel Bowles and Herbert Gintis, Ivar Berg, Christopher Jencks, and, more recently, Henry Levin and Russell Rumberger have questioned from different standpoints the conclusion that increased education necessarily reflects greater productivity.

Jencks focused on the socioeconomic correlates of the lifetime earnings and occupational status of men aged 25-64 and found that family background accounts for a large part of the variation in occupational status in the sample, and, in fact, plays a large role in the decision to pursue further education, regardless of cognitive skills. He defines the difference between good and bad work as a matter of habits, values, and attitudes rather than "knowing the right answers to written or oral questions."

According to Bowles and Gintis, schools do prepare students for work, but not necessarily in the cognitive domain. They argue that the skills imparted by schooling that employers value are primarily non-

cognitive. At the lower levels, these skills include punctuality, obedience, and respect for authority, and at the higher levels, initiative, self-reliance, and the ability to make decisions. Through codified social relations and patterns of rewards and penalties, they assert, the social structure of the school closely resembles that of the factory and office. Thus the grading practices in the classroom encourage the development of traits outside the cognitive domain that are necessary to adequate job performance.

After examining employees' careers in several large companies, Berg concluded that organizational advancement is a function of "loyalty, longevity, and a certain managerial capacity to splinter the skills of others into diverse vertical categories that exhibit nominal rather than real differences." He found that, except at higher levels, educational differences among employees seemed to be of no consequence. " In every instance," he asserts, "the data prove overwhelmingly that the critical determinants of performance are not increased educational achievement but other personality characteristics and environmental conditions."

Levin and Rumberger have followed a line of reasoning introduced by Harry Braverman. They suggest that at the same time as we are producing an ever larger pool of college graduates, technology may be deskilling jobs. Thus, the demand for college-educated workers may be declining. The result is the overeducation of a significant portion of our population in relation to the available work. If this is true, they argue, higher levels of education may actually be counterproductive in the work world because of workers' dissatisfaction with occupying jobs that do not utilize their skills.

These views do not challenge the finding that, generally, those workers with more years of schooling earn higher salaries than workers with fewer years of schooling. What they do question is the assumption that the marketplace rewards the cognitive skills learned in school. According to these theories, employers are not as concerned with evidence of cognitive achievement as they are with background characteristics, credentials, and affective traits.

Recent work by Robert Haveman and Barbara Wolfe indicates that neither the human capitalists nor their critics have considered all the complex channels through which education affects our national economic well-being. Arguing that measures used in the human capital approach and in growth accounting (which attempts to identify and quantify all the sources of economic growth) reflect only a portion of the full benefits and costs of schooling, Haveman and Wolfe consider a wider range of educational effects. These include an increase in the number and quality of leisure activities, a reduction in fertility rates, improved health and increased longevity, more cost-efficient matching of applicants to jobs, a reduction in

income inequality, an increase in social cohesion, facilitation of the process of technological advance and the diffusion of new technologies, and the identification of talented individuals for positions of leadership.

Implications

Educators and employers need to keep in mind all the qualities and competencies that contribute to worker productivity and advancement. They must also recognize that the correlations among levels of educational attainment, salaries, productivity, and personal characteristics are not simple and straightforward. Any attempt to improve the productivity of schools, and through them the productivity of the nation, must begin with an appreciation of the complexity of the factors being measured and of the different interpretations that are possible in looking at similar data.

If education's contribution to productivity is to assume new importance in this decade, then further refinement of the measures of productivity is essential. By assuming that certain correlations are clearcut, such as that between level of education, status attainment, and productivity, educators and policy-makers may do themselves and the educational system a disservice. A comprehensive picture of the factors contributing to worker productivity, particularly to the use of knowledge in work, must consider not only educational attainment, but also affective traits, cognitive skills, family background, reward and punishment systems in schools and bureaucracies, management techniques, and economic and environmental conditions.

2. The Effects of Technology on Skill Levels

Our postindustrial society, according to most observers, is shifting from a goods-producing economy to a service economy, largely as a result of technology. This change is reflected in a rising percentage of "white-collar" jobs related to professional and human services in fields such as education, health, and finance. The implications of the shift for education are not yet fully understood or appreciated, but since the design and use of technology is important to continuing economic growth, school curricula will inevitably need to adapt to demands for the expanding knowledge and skills required for such growth.

Daniel Bell sees two results from this shift to a service economy—a higher premium on education and the necessity for a centralized theoretical knowledge, since newer inventions like computers require an understanding of several fields. Other social scientists such as Peter Blau, Wilbert Moore, and Wickham Skinner have argued that new technology increases the differentiation and specialization of labor and affords workers higher levels of responsibility and skill. Concurring with this judgment are some neoclassical economists who point out that the differences in wages for skilled and unskilled workers have narrowed with increasing technology, an indication that technological advancement has upgraded unskilled jobs.

If a higher level of skills is indeed required for participation in the modern economy, education should play an increasingly important role in preparing students to assume more complex jobs. As will be shown in this chapter, students, more than ever, need a strong background in basic skills—both verbal and mathematical—to operate the sophisticated machinery of the workplace. These skills clearly fall within the province of elementary and secondary education. The extent to which formal education should impart job-specific skills is a matter of more controversy.

Technological Deskilling

In contrast to those who argue that technology raises skill levels, Harry Braverman, Ivar Berg, A. J. Jaffe, Russell Rumberger, and James O'Toole contend that technology may actually lower the skills required in most work. Berg examined the educational requirements for about 4,000 jobs for which educational and training requirements were estimated first in 1957 and then again in 1965. By adjusting these data so that they could be correlated with census reports on the educational achievements of the work force by occupation, he was able to calculate the approximate relationship of educational requirements for jobs to the educational achievements of the American labor force. He concluded that "since 'achievements' appear to have exceeded requirements in most job categories, it cannot be argued helpfully that technological and related changes attending most jobs account for the pattern whereby better-educated personnel are 'required' and utilized by managers."

Braverman argues that managers find it expedient and cost-effective to fragment and routinize jobs over time, irrespective of the skills workers possess. In fact, Braverman finds that the changing conditions of industrial and office work result in a polarization of the skills possessed by managers and those possessed by workers. It is the managers and engineers who gain upgraded skills and are able to mainpulate new technology. Meanwhile, at the other end,

> the more science is incorporated into the labor process, the less the worker understands of the process; the more sophisticated an intellectual product the machine becomes, the less control and comprehension of the machine the worker has. In other words, the more the worker needs to know in order to remain a human being at work, the less does he or she know (pp. 425).

In many cases, technology has transformed skilled workers into intelligent machine tenders. An example of this transformation is afforded by Western Electric Company's manufacturing plant in Allentown, Pennsylvania. According to a report in *Newsweek*, the plant once housed 700 women who manually assembled transistors in old, airy rooms. Today, workers monitor computer consoles in "clean cells that filter out dust and humidity." In the same article, Robert Lund, assistant director of the Center for Policy Alternatives at the Massachusetts Institute of Technology, observed that as a result of installing automated equipment in one firm, "The skills required went down, but the pay went up." In this case, the salary was determined by the need to attract responsible workers to a bor-

ing job rather than by the skills required for performing the work.

In examining a more pervasive innovation, three scholars in Great Britain—Erik Arnold, Lynda Birke, and Wendy Faulkner—have defined the ways in which word processing deskills the job of typing:

> Even typing itself involves varied tasks at present: changing paper, typing, arithmetic for text centering, page layout and so on. Word processors deskill typing tasks by means of such facilities as easy correction, automatic text centering and automatic layout. Thus, while still requiring some basic ability to operate a standard keyboard, word processors dispense with the need for layout skills and high levels of keystroke accuracy (pp. 328-29).

Michael Wallace and Anne Kalleberg of Indiana University recently completed a study of the impact of technological change on unionized hand compositors and machine operators in the printing industry. They found that relative wages for these two occupations, which once required a high degree of visual precision and manual dexterity, have declined steadily in proportion to the wages of all unionized printing workers. From their data they conclude that investment in capital-intensive printing techniques, such as computerized typesetting processes, have deskilled the work of type composers and, consequently, have lowered their relative wages.

How do we reconcile these two seemingly opposing views of the skills needed for work in the world of high technology? Both perceptions —that technology requires a higher level of skills and that technology deskills many jobs—seem to be at least partially accurate.

Certainly those who are responsible for the design of technological innovations and those who manage the production of goods and services need to understand and be able to control the machines that are daily changing our lives. And even the average worker in the service-producing industries may need skills that are not currently required, such as the ability to think critically and manipulate data. The skilled or semiskilled worker in the goods-producing sector, on the other hand, would seem to require fewer of the skills of craftsmanship that characterize the accomplishment of labor-intensive work. Rather, employers expect these workers to have a well-developed sense of responsiblity and the inclination to follow very specific instructions in tending the machinery of capital-intensive production processes.

There is a growing awareness that technology is reducing job satisfaction in certain fields and, therefore, may be affecting productivity. Mike Cooley has written persuasively of the need to "enhance human skill and ability" by designing "systems which are responsive to human judgments,

and which respond to the persons using them rather than acting upon them." As examples of movement in this direction Cooley cites the use of Analogic Part Programming (which conveys information about cutting tools in a manner complementary to the conceptual processes of a skilled machinist) rather than symbolic commands (which attempt to build into the machine the intelligence normally exercised by a skilled worker). Another example offered by Cooley is the development of a computerized program that suggests alternatives for improving the design of a particular system. The human designer then assesses and uses, modifies, or discards these alternatives.

Devaluation of the High School Diploma

Employers are less and less willing to hire high school graduates because of the ready availability of college graduates or of job applicants with at least some college experience. In addition, those who hire assume that white-collar jobs require higher skills than blue-collar jobs. Their unwillingness, however, may not be a result of the educational preparation actually required for a particular job. Empirical evidence contradicts the conclusion that a high school diploma no longer represents adequate preparation for work in a modern technological society (Rumberger 1981a, O'Toole 1975a, Pearce 1965). In his paper delivered at the Interstate Conference on Labor Statistics, C. A. Pearce remarked,

> An example of inadequate reading of the data is found in assertions that automation, space-age technology, and so on, are rapidly carrying us into a situation where high school education will no longer suffice as preparation for a job, that practically everyone will need some sort of postsecondary education or else specialized, protracted job training. . . .

In fact, the skills often listed as important for filling new jobs, particularly those in the service sector, are skills that are or should be basic to the secondary school curriculum.

In their study of the participation of high school dropouts in industries undergoing rapid technological changes, A. J. Jaffe and Joseph Froomkin found that one-half to three-fourths of the work force in these industries had not finished high school. Also supporting their conclusion is the fact that in underdeveloped countries relatively unschooled workers have performed most of the jobs associated with modern machines and technology. Only the managerial jobs have required higher levels of education. Jaffe and Froomkin conclude that "emphasis on schooling because 'modern technology requires it,' especially for those uninterested or unable

to continue their education, is doing education a grave injustice and putting an unnecessary strain on potential workers" (p. 94).

Over and over, employers, in discussing the needs of modern business and industry, are actually emphasizing the need for basic skills, rather than highly specialized or technical skills. When interviewed by Thomas Toch for *Education Week*, Sol Hurwitz, senior vice president of the Committee for Economic Development (a public-policy organization representing 200 major corporations), spoke of employers' concerns about the preparation of students in schools: "There's a widespread feeling within the business community that the schools have failed to produce students who can communicate, who can listen and think, and who can work with other people." Moreover, a report in *School Business Affairs* on a word-processing program offered at a Milwaukee (Wisconsin) high school indicates that students enrolling in the program lacked basic skills required for word processing, such as the ability to spell and punctuate properly, knowledge of proper sentence construction, and the use of correct grammar.

Additionally, in a recent analysis of the impact of new electronic technology on jobs, Richard Riche suggested that the emphasis now is on formal knowledge, precision, and perceptual attitudes. These skills rely on the ability to read and write on a functional level in order to interpret the operating manuals of complex equipment and to facilitate retraining in new skills.

Thus, the skills described by these writers, and echoed by business leaders generally, should be mastered at the secondary level. If, indeed, students are graduating from high schools without these skills, then the answer would seem to lie in the restructuring of secondary education rather than in the indiscriminate advocacy of increased levels of postsecondary education.

A recent article by Susan Foster suggests some of the modifications that will need to be made at the secondary level to better prepare students who wish to enter high-technology occupations. She quotes Roy H. Forbes, associate executive director of the National Assessment of Educational Progress, as saying that schools will need to develop new curriculum materials, find new methods of assessing students' skill levels, and establish training and support programs for teachers. The latter are particularly important, he said, because teachers have the needed skills, but "they have not been trained in the new expectations."

Partnerships to Improve Workers' Skills

One solution to employers' increasing reluctance to hire high school graduates was recently reported in the *Christian Science Monitor*. A Wash-

ington-based nonprofit organization, Jobs for America's Graduates Incorporated (JAG), is overseeing eight test sites that prepare high school seniors for securing their first jobs. The program is inexpensive, costing an average of $1,400 for each student placement, and operates on common sense. Students are advised to "take the braids out of (their) hair. Take a fountain pen to appointments. . . . Shake hands." To date 86 percent of the 9,000 participants have found jobs in fields including retail sales, fast food merchandising, food management, banking, secretarial work, the computer industry, and production-line work. In addition, some graduates have chosen to join the military or pursue a college education.

The students, who voluntarily participate in the program, are identified before graduation as likely to become unemployed. Job specialists work with the students at every available opportunity to provide career counseling. They also sell the program to potential employers. Career development seminars encourage students to develop attitudes of civic responsibility, and students compete in contests involving public speaking, consumer math, and career vocabulary.

Businesses are pleased with the performance of the program's graduates. Significantly, JAG's director attributes some of the enthusiastic response from business leaders to the fact that the program is not federal. The success of a private program such as JAG suggests emphases that could be incorporated into secondary career counseling programs as well as possibilities for cooperation among schools, private organizations, and businesses to improve the preparation and employment prospects of high school graduates.The new federal employment and training legislation, the Job Training Partnership Act, encourages cooperation between schools and private business. Indeed, the nation's corporate and industrial communities show evidence of increasing interest in the performance of the nation's elementary and secondary schools. An article in the fall 1982 quarterly publication of the Education Commission of the States (ECS), entitled "Business and Education Are Natural Partners," describes the proliferating partnerships that include business, government, and education. Such partnerships offer promise for producing high school graduates better able to make choices about future careers or further education and better able to adapt to the workplace.

There is, of course, an inherent concern in the increased involvement of business and industry in educational programs. Will business influence schools to the extent that the curriculum becomes heavily vocational and neglects the liberal arts?

The eighteenth century philosopher David Hume hypothesized that advances in the industrial arts would be complemented by advances in the

liberal arts since the two fields share a reciprocal relationship: "The same age which produces great philosophers and politicians, renowned generals and poets usually abounds with skillful weavers and ship-carpenters." However, in a paper presented at the National Center for Research in Vocational Education, Keith Hampson, a member of the British parliament, voiced an opposing point of view. He describes below the antipathy existing in England between the educational establishment and industry:

> The school system has not become accidentally isolated from the working world outside—it has deliberately insulated itself. Though many comprehensive schools seek to prepare their pupils for acceptance of adult responsibilities, much of their effort is divorced from vocational preparation. . . . Narrow scholasticism must give way to the development of practical talent. An excellent technician is infinitely more admirable than a mediocre philosopher; a first class electrician is vastly preferable to an incompetent sociologist (p. 2).

Although the split between the academic and the vocational worlds is not so pronounced in the United States, there is strong resistance to the establishment of a curriculum geared to the needs of industry and the economy at large. According to Ted Mills,

> Our students are not overeducated. They are *overtrained* in the merchant ethic. . . . By turning over institutions of learning . . . into vocational centers dominated by sheer economic purpose, our educators have, to a considerable degree, foresworn the age-old purpose of learning: the search for being (p. 98).

The effects of increased participation by business in secondary school programs are not yet evident, but it is essential for administrators to be aware of the concern and to heed the warning of Nebraskan educational leader Anne Campbell expressed at the annual meeting of the Education Commission of the States:

> We have to remember that children have the right to be children, that we are not going to program them day by day, that we cannot steep them in the process. Our universal education system has allowed everybody to make a decision for themselves . . . and that . . . is the difference when we begin to compare other nations and our own. . . . While we are looking to change education in our country and perhaps move people into *our* choices, not *their* choices, we may be forgetting why we are where we are and why other nations are trying to come our way.

It is crucially important that we maintain a balance in our school system, not only in curriculum but also in the mechanisms for governance. Business-education partnerships are a valuable tool for making certain aspects of schooling more relevant to the workplace. Nevertheless, they do

not answer every need. We no more want a curriculum tied to the marketplace than we want one lacking relevance to the modern world.

The Role of Vocational Education

During the current recession, marked by declining productivity growth and unprecedentedly high levels of unemployment, interest has grown in the roles vocational education and other alternatives can play in reversing both of these trends. Gene Bottoms, executive director of the American Vocational Association, sees the new Job Training Partnership Act as giving added support to vocational education. The resources of local vocational programs, he contends, are the "logical choice for serving the economically disadvantaged," who comprise a disproportionate share of the unskilled and unemployed labor pool.

Support for the status quo in vocational and career education programs, however, will not be sufficient. Several researchers have questioned the effectiveness of vocational programs, and others have detected socioeconomic repercussions that operate counter to the goals of educational equity.

James O'Toole, professor of management at the University of Southern California's Center for Teachers' Research, has been one of the most vocal critics of vocational education:

> The disparity between the expectations of the young and the realities of the labor market can be most readily, thoroughly, and disastrously resolved through a massive program of vocational education. A lesson of history is that governments can render entire social classes docile and obedient through their educational policies. In the past, in Europe and America (and today most strikingly in South Africa), systems of second-class education for second-class citizens have lowered the expectations and self-esteem of disadvantaged groups and left them willing hewers, drawers, and toilers . . . . Vocational training was . . . a product of nineteenth century industrialism. Today it is correctly viewed as an undemocratic anachronism (1975b, pp. 28-29).

Other shortcomings in vocational education as currently conceived include its often narrow focus on training in specific skills and the frequent neglect of affective and thinking skills valued by most employers. In *Work in America*, written by O'Toole and others, Beatrice Reubens reported the results of an evaluation showing that the initial employment record of vocational graduates—in terms of income, job status, turnover, upward mobility, unemployment rates, and job satisfaction — is no better than that of students graduating from academic programs. This may partially be

explained by the fact that skills taught in vocational programs are not general enough for use in a rapidly changing world and are often obsolete before the students secure their first jobs.

Skills needed in the workplace that are not presently included in the vocational curriculum range from the capacity for socialization to the ability to adapt to uncertain and unexpected situations. Herbert Gintis postulates that the economic return to vocational education is low in the United States as well as underdeveloped countries because vocational training dwells on the "economically relevant" portion of the curriculum and fails to emphasize the "generation of a disciplined, obedient, and well-motivated workforce," which reflects qualities important to managers.

Additionally, O'Toole has found that vocationally trained workers have difficulty adapting to the more democratic forms of self-management that are anticipated to pervade American industry in the future. He sees an inadequacy on the part of these workers in dealing with nonroutine conditions and contends that employers will require more "analytical and entrepreneurial skills, people who know how to solve problems, and people who will not panic when something untoward starts to occur at places like Three-Mile Island." Moreover, he continues, "People who are vocationally trained to unquestioningly perform a single task are manifestly unprepared to design their own work, participate in decision making, assume control over their own working conditions, work as members of a community of equals, or take responsibility for the quantity and quality of their own work when a boss is not looking over their shoulders (1979, p. 19)."

Approaching the subject of vocational education from another perspective, John Goodlad, dean of the UCLA Graduate School of Education, has studied the distribution of secondary curricular opportunities compared to the distribution of teachers by specialty. His findings, published recently in a book entitled *A Place Called School*, indicate that there is enormous variability in the assignment of teachers and that vocational education teachers comprise a disproportionate share of the teaching force —24 percent in senior high schools. In some schools, vocational education teachers constitute over 40 percent of the teaching force.

According to Goodlad, vocational education enjoys curricular luxury as a result of this distribution. Vocational teachers teach their specialty while English, math, and social studies teachers are "spread all over the place." He attributes the inconsistent allocation of the teaching force to the fault of omission rather than to conscious design.

In response to this forceful indictment, others suggest that vocational education, offered as a choice rather than a necessity, may help to keep students who are not academically inclined from dropping out of school.

Jaffe and Ginzberg both express the need for a *modern* program of vocational education to provide skills for those having little interest in or aptitude for academic work. And although Rumberger and Thomas Daymont have found that, for students who do not attend college, differences in high school curriculum appear to have little effect on employment opportunities, they did determine that there were payoffs to certain specific vocational programs when the training was actually utilized in later jobs, especially in programs training for office occupations. They concluded, therefore, that both vocational and academic curricula show positive results in specific circumstances.

The National Center for Research in Vocational Education at Ohio State University has investigated the effects of participating in a vocational curriculum. In 1981, research staff at the center examined almost 1,500 studies covering such topics as earnings, employee satisfaction, academic achievement, and basic skills attainment. The literature surveyed indicated that a majority of vocational education graduates found employment related to their technical training, particularly in the fields of business, office, and health education. In addition, vocational graduates were found to be confident in their skills.

There is also evidence that vocational educators are interested in incorporating more general skills, such as those O'Toole emphasizes, into their programs. Stuart Rosenfeld, director of research and programs for the Southern Growth Policies Board in Research Triangle Park (North Carolina) refers to a "generic" approach to vocational education that results in a closer connection to the regular secondary program. According to Rosenfeld, vocational agriculture exemplifies for some a successful model encompassing less specialized and more integrated training. He states that by "combining farming, business, and problem-solving skills with strong leadership training, vocational agriculture has contributed to large gains in productivity."

Aside from traditional vocational education programs, there are several different ways in which skills training can take place. Career education, a concept originating in the early 1970s, places emphasis on career planning in elementary and secondary schools and on work/study programs. Recurrent or lifelong education offers workers the potential for developing new skills by interrupting work and undertaking further study at any point in their lifetimes. Corporate education, which can include on-the-job training or formal classroom instruction, is becoming an ever-increasing factor in the provision of skills needed in the marketplace.

One impediment to the success of work/study programs or recurrent education is the perception that a college education yields very high returns

to the individual. Thus, many students are unwilling to participate in such programs for fear that postponing or interrupting a postsecondary education would be detrimental to their career opportunities. The continuing perception of a college education as economically desirable contributes to the problem of overeducation that has been identified by many scholars and is examined in the following section.

The success of career or recurrent education programs rests on close cooperation between schools and businesses. Students will not be enthusiastic participants in a program they see as shunting them off to a less direct track to economic rewards. Business representatives and educators will need to carefully define the skills that need to be taught, whether they be affective, academic, or technical; they will need to ensure that the work performed by students in work/study programs is not fabricated or meaningless; and they will have to demonstrate that such programs yield tangible benefits to those who complete them.

Of crucial importance in recurrent education is the problem of workers' reentry into the workplace. O'Toole cites a German retraining program as evidence that such efforts can succeed. This particular project facilitates midcareer retraining and job change, which requires giving special attention to job placement after training. Preliminary evaluations have indicated that the program has had positive effects on productivity and worker satisfaction.

Corporations seem to be assuming more responsibility for training workers in specific job skills and, in some cases, in basic skills. Seymour Lusterman has suggested that employee education programs have attained the status of a "shadow educational system." In 1975, he reports, the 7,500 largest private employers in the United States spent over two billion dollars on employee education, mostly to prepare present employees for accepting new responsibilities, improving their performance, or adapting to new technology.

In some cases, unions have become involved in training programs to help members adjust to major changes in technology. Ginzberg noted that the plumbers and pipefitters expended one million dollars annually to administer a training program jointly with Purdue University. Other cooperative ventures have contributed significantly to increased productivity, such as the successful attempts to improve plant safety in the West Coast pulp and paper industry.

Lusterman suggests that educational institutions could learn important lessons from corporate training programs. He attributes the success of many such programs to active student involvement in learning processes; efforts to tailor methods, course length, and curriculum to individual needs;

increased use of programmed materials and advanced instructional technologies; specifying desired results of particular learning programs in terms of new knowledge, behavior, attitudes, or sensibilities; and use of performance evaluation to make appropriate modifications in the programs.

Tracking Systems and the Paideia Proposal

If educators follow the recommendations of Lauren and Daniel Resnick or Mortimer Adler and his Paideia group, vocational training in secondary schools will either be radically altered or eliminated altogether. In an address to the National Commission on Excellence in Education, the Resnicks proposed that all students be required to complete a strict core curriculum regardless or their postsecondary aspirations. By gaining competence in mathematics, science, English, history, and foreign languages, they contend, students in vocational education would master the fundamental ideas behind the trades for which they prepare. They also urged replacing national aptitude tests (primarily the S.A.T.) with regularly held examinations in specific courses of study.

Adler and his Paideia Proposal would do away with vocational education altogether. The Paideia group seeks to revolutionize American schools by instituting a one-track system of public schooling that pursues the same objectives for all children, according to an article by Susan Walton for *Education Week*. Adler argues that elementary and secondary schooling must prepare students for adulthood and participation in society "*not* by training them for one or another particular job in our industrial economy, but by giving them the basic skills that are common to all work in a society such as ours."

The recommended curriculum under the Paideia plan would include the basic skills—reading, writing, speaking, listening, observing, measuring, estimating, and calculating—and would allow only one elective, a second foreign language. Coursework would be organized around the disciplines of language, literature, fine arts, mathematics, natural sciences, history, geography, and social studies. In addition, the proposal requires that teachers master three kinds of teaching methods—didactic or lecturing, coaching, and questioning. Teachers unfamiliar with the Socratic method would need to be trained in its use.

The Paideia Proposal answers the concerns of those who question the equity of a tracked system of education that prepares some students for higher education and professional jobs while placing others in courses that lead to lower occupational expectations. However, it raises another equity problem. Students who are low-achievers in traditional academic courses

and feel more successful in a vocational program might be more likely to drop out or fail under the Paideia plan. Frequently, the greater proportion of these students are members of minority groups or from families of low socioeconomic status.

Those interested in the proposal will have an opportunity to see it implemented. The school boards in both Atlanta (Georgia) and Chicago (Illinois) have approved the plan for use in their schools, and Atlanta has scheduled a pilot program to begin in fall 1983.

Implications

Technology has substantially affected our perceptions of how much education is desirable or required to keep pace with current and forecasted changes. Some researchers suggest that skill levels are rising and will need to continue doing so. Others argue that the actual skill levels required for technological work are lower than those required for manual work. Both arguments support the notion that human knowledge and skills are important determinants of economic productivity, but they differ over the types of skills that should be stressed in schools.

Those who believe there is a shortage of job-specific or highly specialized skills give impetus to the movement toward more vocational training in the schools. On the other hand, those who believe that work in general is becoming deskilled emphasize the need to design work systems that make better use of human skills. They see vocational training as a way of narrowing student competencies and lowering expectations, in other words, of tailoring the skills of workers to the needs of the workplace.

Employers are concerned about student mastery of basic skills. Some have actually invested in remedial education programs to bring their workers to a level of competency required for adequate productivity. From the evidence presented on the skills found lacking in many young workers, it seems apparent that schools' first priority should be the teaching of a core of skills, including reading and comprehension, mathematics, language arts, the social, natural, and physical sciences, written and oral communication, and foreign languages. Vocational training should be considered an addition to, not a substitute for, courses in basic skills.

On-the-job training has demonstrated its effectiveness in preparing workers for specific jobs after they have acquired an acceptable level of general knowledge. Perhaps educators in the public school system and in business can cooperatively define those skills best taught in school and those most successfully taught in the workplace. With an increased emphasis on basic skills in the schools, businesses may find less need for

devising remedial programs.

By considering how to train students to cope with the requirements of an advanced society, we may be approaching technology backwards. Mike Cooley reminds us of the importance of designing technology to serve human needs and utilize human skills. We should be, after all, the masters rather than the victims of technological development. Education can serve as beneficial a role in shaping students' perceptions of technological versus human capacities as it can in teaching the skills needed to operate the machines of the workplace.

Kenneth Duckworth, assistant director of research at the Center for Educational Policy and Management, University of Oregon, sees yet another implication from the analysis of the effects of technology on worker skills and job satisfaction. In an environment where technology accomplishes much of the work and workers become machine tenders, Duckworth suggests that education may have an important role to play apart from the teaching of basic skills. When work is not satisfying, as is likely to be the case when it consists of continuous monitoring of machinery, avocational interests assume greater significance. A broader, more adaptive view of life (the result, many argue, of a liberal education) may provide workers in jobs deskilled by technology with the ability to find other meaning in life.

3. Overeducation and Productivity

> . . . With the passage of time there has been a tendency for a larger group of persons to be in jobs that utilize less education than they have.
>
> Ivar Berg

Accelerated changes in demography, educational attainment, and employment opportunities have accompanied the last thirty years of American economic growth. The "baby boom" of the late 1940s first resulted in the rapid growth of the business of education and then provided a large reserve of labor just as the American economy began to slow down. This same group of postwar babies pursued degrees in higher education with a vengeance, encouraged by the dramatic increase in white-collar jobs opening up in the services sector of the economy.

Problems in Supply and Demand

In the 1980s, the demographic pattern has been reversed, as we witness the consequences of the zero population growth movement and improvements in birth control devices, women's entry into the labor force in large numbers, the postponement of marriage and child-rearing beyond the late teens and early twenties, and the increase in single-person households. And in the last fifteen years, the unemployment level has doubled as has the percentage of workers who have completed a year or more of college. Anne McDougall Young reports that, as of March 1981, 40 percent of workers aged 25 to 64 had completed one or more years of college. In 1970, the comparable figure was 26 percent, and in 1976, 33 percent.

Despite this plentiful resource of highly educated workers, only one-fifth of the jobs in the economy in 1976 required that level of schooling, according to Russell Rumberger in his book *Overeducation in the U.S.*

Labor Market. Moreover, The Survey of Working Conditions prepared for the U.S. Department of Labor in the early 1970s reported that 35 percent of all workers in America feel overqualified for their jobs. And Morris Horowitz and Irwin Herrnstadt, in a study based on U.S. Employment Service trait requirements, found that educational achievements were changing much more rapidly than jobs, despite the claims that technology was revolutionizing the workplace.

In Young's recent study of workers' educational attainments cited above, the data show that the proportion of workers in professional, technical, and managerial occupations increased from 26 percent in 1970 to 29 percent in 1981. She notes, however, that a smaller percentage of college graduates were able to secure professional or technical jobs because of the increased competition for a finite number of positions. Whereas 67 percent of employed college graduates held professional-technical jobs in 1970, only 54 percent did so in 1981. A larger proportion of graduates was found to hold managerial positions in service occupations in such enterprises as banking or investment services, to be salesworkers, or to be blue-collar workers.

Correlating all the data gathered in different years and analyzed with different methodologies is virtually impossible. What the figures do suggest, however, and what our folk wisdom has been telling us for years in stories about the Ph.D. pumping gas at the corner service station, is that the number of college graduates has outpaced any increase in the number of jobs commensurate with their skills.

The resultant surplus in college graduates relative to high-level jobs creates conditions that meet all three of Rumberger's definitions of overeducation. He shows overeducation to occur

1. when the individual returns from schooling fall below their historically high level, or decline relative to other investments,
2. when an individual's expectations for occupational status as a result of investment in schooling are not realized, or
3. when individuals are employed in jobs that do not make full use of their educational experiences.

Human capitalists argue that the current situation reflects a temporary imbalance that will be corrected as individuals adjust to the needs of the marketplace in making choices about postsecondary education and as employers exercise flexibility in the use of their workers. Two factors may help to reestablish a balance in the supply of and demand for college graduates. Colleges are experiencing a reduction in enrollments as the "baby boom" generation reaches middle age, tuition and other costs rise, loans become harder to obtain, and jobs are not guaranteed to everyone earning a diploma. Moreover, many think that technology and the growing

services sector will create more jobs requiring a college education.

On the other hand, those disagreeing with the human capitalists believe the current situation is not going to be remedied by free market forces, but is, in fact, "endemic to the capitalist system." They argue that employers may not be able to use labor with complete flexibility. Lester Thurow has suggested the possibility that skills and marginal products (increased output from one additional unit of labor, capital, or land) may be associated with jobs rather than with workers. Following his reasoning, Rumberger postulates that

> skill requirements for jobs may be established independently of the supply of educated labor, so that workers can be over qualified for the jobs that they hold. Although employers may raise the . . . entry requirements of jobs as a result, those requirements have little to do with the tasks or skills required (1982, p. 12).

In a study completed in 1981, Rumberger examined data collected in 1960 and 1976 to ascertain what changes might be occurring in the skill requirements for jobs. He found that in the sixteen-year period, changes in the distribution of employment among occupations and changes in skill requirements for individual jobs had combined to narrow the general levels of skills needed in the economy. There was a decrease in the number of jobs requiring the highest and lowest levels of skills and an increase in those requiring middle-level skills. Rumberger is cautious in drawing inferences from his study, but he does suggest that the decrease in opportunities for high-skilled employment coupled with the substantial growth in numbers of college graduates may have resulted in an increasing number of workers who hold jobs for which they are overqualified.

Possible Consequences

Where, then, do the findings on overeducation converge and what is the significance for our educational system? Whether or not skill levels have actually declined, it appears evident that overeducation is a problem that must be recognized and examined for its effects on the productivity of the labor force.

A study of the consequences of overeducation requires a blend of perspectives—those of the sociologist, the educator, and the industrial psychologist. John Meyer, James O'Toole, Ivar Berg, and Henry Levin and Russell Rumberger have all spoken of possible connections between overeducated workers and job dissatisfaction because of heightened expectations. O'Toole states,

> The rapid increase in the educational attainment of the work force has been accomplished by a concommitant rise in worker expectations . . . . Increasingly, young workers prefer jobs that are interesting, socially "meaningful," and offer the opportunity for personal growth over jobs that offer only the traditional . . . rewards of money and security . . . . The rub is that no industrialized nation has been able to produce an adequate number of jobs that provide the status and require the skills and educational levels that their work forces are achieving (May 1975, p.28).

Moreover, O'Toole continues, studies conducted at the University of Michigan show that people who feel they deserve better jobs than they have can suffer from "status conflict." At the extreme, some of these workers feel inextricably trapped in dull, unchallenging jobs. Another study, undertaken by Sandia Laboratories, indicates that it is the *intelligent* blue-collar workers who are probably most responsible for the occurrence of malicious damage, low productivity, mistakes, and accidents at work.

Most recently, Val Burris used data from a national survey conducted in 1977-78 by the National Opinion Research Center (NORC) at the University of Chicago to explore the effects of overeducation on job satisfaction, political leftism, political alienation, and social stratification ideology. The NORC data show that the highest percentage of overeducated workers among white males are college postgraduates—those who have attained seventeen years of schooling or more. We might expect that the next highest group would be college graduates, but, surprisingly, it consists of those with thirteen to fifteen years of education.

Despite different approaches and methods of analysis, the NORC data are generally consistent with Rumberger's findings, arrived at independently. Rumberger found that—except for college graduates—blacks and other nonwhites are more overeducated for their jobs than whites and that males and females experience similar levels of overeducation. Rumberger also found that those with fewer than twelve years of schooling may be undereducated for their work, whereas the NORC study indicates that a surprising percentage of high school graduates are overeducated—18.1 percent of males, but only 6.9 percent of females. Burris attributes the discrepancy between males and females at this level to the fact that "women high school graduates are more concentrated in low-level white-collar occupations which utilize the skills taught in high school, while male graduates are more likely to enter into unskilled or semi-skilled manual occupations."

A recent report by the United States Commission on Civil Rights gives added support to the argument that nonwhites are relatively more overeducated for their jobs regardless of their educational training. It concludes

that, in many instances, disparities in job market opportunities among the various population groups were "greater among workers with more education," and "at every educational level. . . blacks and Hispanics generally experienced higher levels of unemployment and underemployment than majority men."

Another trend indicated in the NORC study is that those from working class backgrounds (whose fathers were not employed in professional or managerial occupations) were more likely to be overeducated for their work than those from middle-class backgrounds. To explain this phenomenon, Burris postulates that the trend is reflective of the differences in the kinds of schools attended by working- and middle-class students "as well as cultural mechanisms which restrict the mobility of working-class students independently of the acquisition of educational credentials," the thesis of Samuel Bowles and Herbert Gintis.

In analyzing the effects of overeducation on workers, Burris found that overeducated workers do experience more job dissatisfaction, but that the dissatisfaction is pronounced only among workers who have an excess of at least four years of education beyond the requirements of their jobs. Burris thus concludes that neither his nor other previous studies "provide convincing evidence that moderate discrepancies between education and occupation are responsible for major increases in job dissatisfaction."

Overeducation seems to have few political effects, according to Burris's study. He did find, however, that overeducated workers tend to be less accepting of achievement ideology—the assertion that people get ahead by their own hard work—or of organized labor. In identifying their social class, moreover, they may give greater attention to status-conferring factors, such as educational credentials, than to the characteristics of their jobs.

Burris's work suggests that overeducation will probably not lead to political repercussions, but his findings do not in any way imply that the fact of overeducation can or should be safely ignored. Since some workers' skills are underutilized at every occupational level, it behooves not only educational institutions, but also employers, to pursue better ways of preparing students for the transition from school to work and of using their skills once they have entered the work force.

Toward Greater Equilibrium

There may be limits to the adjustments schools can make in confronting the problem of overeducation. Educational policy-makers could follow the examples of countries like Sweden, Japan, Russia, and China in restrict-

ing access to higher education and thereby reducing the numbers of graduates with expectations for jobs requiring high-level skills. Simultaneously, the stratified levels of postsecondary education could be increased, offering less academically promising students opportunities for skill training through community, vocational, or recurrent education programs.

Such suggestions raise objections because they obstruct efforts to achieve educational equity and tend to narrow opportunities for social and economic mobility. Both Lester Thurow and Christopher Jencks have found a high correlation between academic achievement and socioeconomic status. Those students who demonstrate high scholastic ability in school tend to come from families with high socioeconomic status. Jencks is careful to point out, however, that such ability is not necessarily reflective of differences in intelligence. Thus, a system that offers a college education to a select group and trains the majority through more vocational programs may severely limit the chances of students from families of low or medium status to secure professional and technical jobs.

A counter argument is offered by William G. Conroy, who claims that the concerns for equality in the United States "appear to be reaching death-wish proportions." Conroy credits the country's inability to produce an internationally competitive and productive work force to the absence of programs for the academically talented and to the decentralization of decision-making for both education and employment training programs.

Gains in educational equity have not produced economic equity, nor have they realized all the dreams of the Great Society. Nevertheless, the fact that, as of March 1981, 80 percent of the employed American population had completed a high school education or beyond indicates the degree to which educational credentials are valued by employers. To reverse the trend of the last two decades and give emphasis to the selection and training of the most competent workers without continuing to promote educational access for the disadvantaged would surely invite a divisiveness and unrest more counterproductive than an inefficient labor force.

Changes in the Workplace

> There has been a long-time feeling that if work and education were out of kilter, the "greasing" needed to be done on the education side. Now there is the realization that the problem is on the work side.
>
> Willard Wirtz

The broad extension of the educational franchise, hand-in-hand with the liberalizing trends that grew out of youth protests in the late 1960s and

early 1970s, significantly altered the content of education and as a result helped to produce a different kind of worker. The new worker comes to the job with higher expectations for work that should be life-enhancing and permit a degree of autonomy and control over the tasks at hand. Young, educated workers have been less adaptable to traditional bureaucratic organization and hierarchical authority. Pehr Gyllenhammer describes the conflict between the young worker's expectations and the organizational structure of the workplace, which has remained basically unchanged since the Industrial Revolution:

> People entering the workforce today have received more education than ever before in history. We have educated them to regard themselves as mature adults, capable of making their own choices. Then we offer them virtually no choice in our overorganized industrial units. For eight hours a day they are regarded as children, ciphers, or potential problems and managed and controlled accordingly (Wirth 1981, p. 2).

In consequence, the problems of overeducation and resultant job dissatisfaction have become more of a concern in the workplace than in the classroom. Innovations in the organization and design of work have demonstrated that it is possible to utilize workers' skills that may exceed the requirements of their job descriptions.

The Swedish auto company Volvo experienced increased problems with absenteeism, sloppy work, alcoholism, and malicious mischief in the 1970s, as the work force began to shift toward younger, more highly educated workers. Initially, according to Willard Wirtz, the company's management began to consider adjustments that could be made to maintain the old industrial system and still increase productivity. One alternative would have been to hire less educated Finnish and Turkish workers, who would be more docile and accepting of the traditional bureaucratic work environment. Before pursuing this plan, Volvo's executives realized its irrationality. They were failing to focus on the real need of how to best use the skills and meet the expectations of the young, educated Swedish worker. After further consideration, they created a work process to increase worker autonomy and collegial collaboration through work teams, job rotation, collaborative trouble-shooting, and shared responsibility for quality control. Gyllenhammer describes the results as an "unlocking of worker potential that has become as important as any display of brilliance in technical terms."

Further support for the positive effects of worker participation on productivity is found in Edwin Fleishman's study of garment workers. In the group Fleishman observed, productivity (measured in terms of worker

income, which was based on a piece rate) always dropped when a new dress style was introduced. The study attempted to determine whether the drop in productivity and subsequent recovery were due to attitudinal or skill-learning factors. Productivity was found to stay more constant when workers were allowed to participate in the planning for a style change—pricing of individual operations, operation sequence, and bundling procedures. In fact the work was accomplished in less than half the time expected. However, when no further attempts at participation were made, productivity eventually fell back into the old pattern. Fleishman concludes from this that the drop in productivity with each new style was caused more by attitudes than by the need to learn new skills or relearn old ones.

Increased worker participation and autonomy are also emphasized in Japanese and European management techniques now being adopted experimentally in the United States. Significantly, the movement toward worker participation in Sweden seems to have generated a growing demand for the recurrent education of workers, according to Stanley Nollen. Workers apparently perceive education as a means of exercising their new rights to keep abreast of technological changes and to improve their positions in the labor market. Recurrent education may assume a greater role in the United States as well.

In a recent paper for the National Institute of Education, Edward Lawler postulates that firms engaging in work requiring knowledge of high technology will be characterized by turbulent environments. To maintain effectiveness in such an environment, these organizations will have to adopt "more organic and participative management styles which require decision-making skills, self-management skills, and planning skills to be generally present in their work forces." Thus, the skills of well-educated workers in these firms will be better utilized than in the repetitive tasks that constitute much of industrial work. If businesses do not move in this direction, according to Lawler, "we can predict that a number of problems will occur, including poorer national economic performance and increasing levels of employee dissatisfaction."

Lawler sees evidence that organizations are making significant efforts to shift to more participative management styles, reflected in the proliferation of quality circles, the use of employee attitude surveys, experimentation with self-managing work teams, flexible time schedules, cooperative problem-solving between unions and management, and new designs for plant structures to minimize the distance between workers and managers. Lawler attributes this experimentation to the emphasis on the advantages of participative management in business schools for the last twenty years. Business school graduates from this period are now assuming positions of

responsibility in their companies and instituting some of the ideas they gained from school.

Implications

Ivar Berg has argued that "purposeless credential consciousness" does not benefit education. In fact, it devalues the contribution of elementary and secondary education and diverts higher education from its primary purposes. According to Berg, higher education should be free to pursue "its promise to liberate people and to help preserve for a society its better traditions and commitments."

Needed now is a new assessment of the potential that should be realized at each level of education. Rather than an indiscriminate escalation of the schooling credentials required for work, which leads to overeducation, educators and employers need to consider ways to enhance the value of a high school diploma. It is at the secondary level that resources must be concentrated. If the content and standards of secondary education are strengthened, then higher education can follow suit and shift back to the high schools those functions that appropriately belong to them.

In an effort to reduce the amount of remedial instruction needed for incoming students, particularly in English composition and math, universities nationwide are scrutinizing their admissions requirements. The National Association of Secondary School Principals surveyed the presidents of fifty state universities in the summer of 1982 and found that twenty-seven of the fifty state systems have increased the admissions requirements or are reviewing them.

According to the study, the new standards usually center on course requirements. "Additional mathematics credits are cited most frequently, followed by social sciences, with English and science tied for third place. Four years of English commonly will be required . . . along with two or three years of mathematics." A related trend in strengthening admissions standards is the raising of the minimum grade point average required. Five states currently require a 3.0 average or above.

Obviously, these changes have important implications for the secondary school curriculum and the preparation of college-bound students. The most immediate result will probably be a shift in course enrollments as students work toward meeting the higher standards. To meet the higher grade-point requirements, students may compete more vigorously at the secondary level. In addition, parents may exert pressure to raise academic standards in high schools to ensure college admission for their children.

Given the current emphasis on educational excellence in the litera-

ture on effective schools and the phenomenon of shrinking enrollments, the time seems opportune for the restructuring of secondary schools. A recognition on the part of those in education, in business and industry, and in government that this level is presently the proper locus of effort will contribute significantly to the attainment of higher standards at both the secondary and postsecondary levels.

The workplace, too, offers possibilities for addressing the problems of job dissatisfaction that can result from overeducation. Promoting greater employee participation in planning for work and allowing workers more autonomy and control over their work may help to make routine or mechanized tasks more satisfying. In addition, in the design of technological systems, attention should be given to promoting the best use of human skills.

Both educators and employers concerned about the relationship of education to work can profit from E. F. Schumacher's conception of the functions of work. Schumacher believes these functions need to be taught in school as well as recognized in the workplace.

> Traditional wisdom teaches that the function of work is at least three-fold: to give workers a chance to utilize and develop their faculties; to enable them to overcome their inborn egocentricity by joining with other people in a common task; and to bring forth the goods and services needed by all of us for a decent existence. Now, I think all this needs to be *taught.* (Vermilye 1977, pp. 55-64)

Lawler offers specific suggestions for what students need to be taught in preparation for their participation in "high involvement" work organizations. He recommends that in the middle grades students begin to study economics, including information about costs, sales, profits, markets, and regulations. Interpersonal and group communication skills also need to be learned for participation in work teams.

Perhaps a combination of the different approaches described here can reduce the incidence of overeducation and enhance job satisfaction. A revision of curriculum and standards seems called for at both the secondary and higher levels of education. Work design needs to begin with the skills of the workers themselves. And finally, work and the preparation for work should be envisioned broadly, after Schumacher, as well as narrowly, in terms of specific skills and credentials.

4. Meeting Current Needs

Present educational planning attempts to look ahead and evaluate the effects of the computer and other technology on the symbiotic relationship between education and work. Attention has focused on the need for more and better instruction in math and the sciences as a foundation for understanding and using the sophisticated tools of the future. In addition, a smaller, less strident voice is being raised in support of increased foreign language requirements and international studies programs to facilitate two-way communication with a world no longer content to consider English as the only language of diplomacy and commerce. And not least of the needs spawned by the technological revolution is the ability to locate, evaluate, and adapt information to specific purposes. These skills, say many, are imparted through a broad rather than a technical curriculum.

Science and Math

A cursory look at any newspaper or popular magazine today is all that is needed to show that the educational and business establishments and the federal government are concerned about the shortage of graduates in science and math. Of special concern is the need for elementary and secondary teachers trained in these disciplines, particularly in higher math and the physical sciences.

This concern was manifested and given nationwide publicity during the National Academy of Science's National Convocation on Precollege Education in Science and Mathematics held in Washington, D.C., May 12-13, 1982. In his address, which has been quoted repeatedly, Paul Hurd of Stanford University deplored the failure of Americans to appreciate the importance of science and math to economic and cultural progress. He stated that other nations, such as the Soviet Union, East Germany, and

Japan, offer specialized instruction in science and math beginning in the fourth grade. Students in those countries spend up to three times as many class hours on the two disciplines as do American students.

One response to the scarcity of qualified math and science teachers and graduates has been the introduction of seventeen bills in Congress that in one way or another try to increase the supply and quality of math and science teachers. In his address at the Education Commission of the States' annual meeting in August 1982, Governor James B. Hunt, Jr. of North Carolina pointed to other promising programs already initiated: special diagnostic, prescriptive programs in arithmetic in the states of New York, Colorado, and Missouri and the establishment in North Carolina of a full-time residential high school for students gifted in math and science. In addition, Johns Hopkins University offers fast-paced summer programs for students ages eleven to fourteen demonstrating unusual talent in math, writing, or science.

An analysis of survey results on the knowledge and skills of American seventeen-year-old students by the National Assessment of Educational Progress (NAEP) reveals some specific weaknesses in the mathematical abilities of the nation's youth. According to authors Lynn Grover Gisi and Roy Forbes, from 1973 to 1978 students declined in their demonstration of mathematical understanding, their use of mathematical applications, and their ability to complete multistep math problems. In general, the NAEP surveys suggest that "students have acquired very few skills for examining ideas. Many are capable of preliminary interpretations, but few are taught to move on to extended comprehensive and evaluative skills."

Foreign Languages and International Studies

Other fields viewed as neglected in our schools, but important to our position in the world, are those of foreign languages and international studies. In a world interlaced by communications systems that recognize no national boundaries, the United States is hampered by an inability to understand not only the languages but also the cultures of other nations. Some argue that our ability to coexist and trade successfully with the countries of the world is ultimately of greater importance than our use of technology.

The Presidential Commission on Foreign Languages and International Studies published its findings in November 1979. The commission made over 130 recommendations to strengthen international education at every level. Stressing foreign language competence and international consciousness, the report demonstrated the importance of international educa-

tion to America's foreign trade effort and to its success in international diplomacy.

Still, foreign languages and international education have not been given a high priority in curriculum planning. For the most part, the comments of Betty Bullard, commission member, hold true today.

> The most serious problem is lack of "concern" . . . for international education at administrative levels . . . . In general there has been a pulling-in of budgets, reducing the purchases of instructional materials. Added to this is a nation-wide trend to "return to the basics" in education. Everywhere people are clammoring for the "three R's" while demanding competency-based testing and national assessment/accountability . . . . An acute problem is the severe overcrowding of the schools' curricula. There are so many special emphases and "add ons" in the curriculum that there is literally no time left for anything else . . . [things such as] career education, citizenship training, and free-enterprise economics.

Bullard goes on to assert that piecemeal restructuring of the curriculum will not help. She recommends that the remodeling be complete and involve professional associations, scholars, specialists, textbook writers, and professional educators and administrators. The greatest task, of course, is the reordering of priorities to reflect the needs of both the present and coming generations.

A Broad-Based Curriculum

> Employers may need individuals who can think holistically, creatively, and nonideologically and who can see interrelationships and interactions among nonrecurrent events.
>
> James O'Toole

It is a temptation, in time of crisis or substantial change, to concentrate on one answer to a problem, even in answer to those problems that, according to O'Toole, do not have a solution. Consequently, during the current preoccupation with technology and specialization, it is important to be reminded of those skills found to be productive that are not part of any one discipline.

Based on their evaluation of existing skills and needs as revealed in the NAEP results, Gisi and Forbes have compiled a list of the "basics" that will need to be mastered by future workers:

evaluative and analytical skills
critical thinking
problem-solving

organizational and reference skills
synthesis
application
creativity
decision-making (with incomplete information)
communication skills (using a variety of modes)

The NAEP results and the higher-level thinking skills required by a technological society that is increasingly devoted to the processing of information point inevitably to needed curriculum reforms. Gisi and Forbes argue that "with technological devices pervading everyday lifestyles, students who are not planning a technical career will need an understanding of the basic principles underlying their operations." By the same token, the thinking, evaluative, and comprehension skills needed for future work are not necessarily covered in a technical course of study.

These overlapping needs suggest the efficacy of providing a general grounding in academic courses for all students. Much of the literature on skills needed for the computer age refers to general rather than specific or vocational skills, and the emphasis is on the interdependent nature of these multidisciplinary skills. James O'Toole sees a continued, if not more pressing, need for broadly educated workers:

> The problems most people face at work are complex, interdependent, and above all have to do with working with people cooperatively and ethically. Most of the really tough problems that people encounter at work are not technical—the computer can be made to solve those. Indeed, the toughest questions are not problems at all, if a problem is defined as having a single solution. For there are no solutions to the tough policy and organizational problems of work—there is only a spectrum of alternative responses . . . . It is such problems that a broadly educated, truly enculturated worker is best equipped to handle (1979, pp. 20-21).

Gisi and Forbes, O'Toole, Sol Hurwitz, Richard Riche, and others previously cited in this paper have reiterated the need for critical thinking skills in workers of the future. Many employers talk in abstract terms about the poor problem-solving capacities of young workers. O'Toole makes an important distinction between problem-solving as we have visualized it in the past and problem-solving as it will be required in the future. He foresees that workers trained in unidimensional problem-solving methods, such as cost-benefit analysis and statistical regression, will become anachronistic as computers take over routine problems treatable by formulaic solutions. Instead of finding tidy answers to recurrent problems, O'Toole envisions future workers facing "intransigent systemic" problems—energy, food

availability, unemployment, urban decay— that "cannot be solved by empirical trial and error or reduced to mathematical precision . . . . Perhaps it is not problem solving at all that is needed in business, government, and academia, but problem identification and definition."

An important attribute identified with a broad education is the ability to adapt to change. Often, the narrowly trained specialist finds such adjustments more difficult than does the more generally trained worker. O'Toole reports:

> Significantly it is starting to dawn on corporate leaders that they need broadly and liberally educated employees. In the last two decades, corporate recruiters and personnel managers have been hiring narrowly trained specialists to fill lower-level openings. While these new hires meet the immediate needs of a firm, as time goes along it becomes clear that they are not promotable. Thus American corporations now are being forced to spend hundreds of millions of dollars on employee education in a not terribly successful effort to prepare lower- and middle-level employees to assume greater responsibility (1979, p. 8).

Industrialist William Agee has also articulated the need for a wide range of abilities to function competently in the business world. In an address to a national meeting of business educators, he remarked, "I would hope that you are working hard at producing more than a student of business. Clearly, managers of the eighties must be political animals . . . . The business of business today is the whole sociopolitical economy."

The hiring experiences of an Omaha businessman, Sam Bittner, reported in the *Chronicle of Higher Education*, demonstrate the kinds of skills often needed in technical businesses that are not necessarily supplied by a technical education. Bittner hired a college graduate with a background in history and English and a master's degree in foreign languages to manage his midwestern scrap-metal business. Through intelligence, imagination, and logic, Bittner says, his manager has turned the business into "one of the most efficiently run metal industries in the Middle West."

Bittner's testimony to the values of a broad education includes the story of his quest for a chemical or electrolytic process that could be used at a mine site to extract beryllium directly from the ore. He engaged several consulting engineers who searched computer tapes and found nothing. Then he hired a college student majoring in Latin American history with a minor in philosophy to research the Bureau of Mines archives for such a process. Bittner felt he was asking for the impossible, but five days later the student returned with information not only on extracting beryllium on site, but also on processes for the recovery of residual ores that contain

beryllium.

Bittner concludes with the assertion that while other companies are interviewing the engineering and the business administration students, he'll be looking for the generalist:

> It is unfortunate that our business world has become so structured that it demands specialization to such a degree that young people feel the need to learn only specific trades. By getting that type of education they hope to be able to find their way into one of those corporate niches.
>
> If we continue with the present trend of specialized education, we are going to be successful in keeping a steady supply of drones moving to a huge beehive . . . . Have we lost sight of the fact that people are the most important commodity we have? [illegible] each with intelligence, imagination, curiosity, impulses, emotions, a[illegible]nity. In my business I want people who have those intangible qua[illegible]

Implications

The evidence presented here is not intended to suggest that every student should become a generalist. What it does indicate is a compelling need to evaluate the type of curriculum that will best prepare students not for specific jobs but for a range of tasks that will be required by society and industry in the near future.

Adaptability appears to be one essential quality demanded by rapid technological change. Educators must consider to what degree a curriculum that is becoming increasingly specialized at the secondary and post-secondary levels will produce workers who are flexible and able to adjust to continuing obsolescence.

The other skills identified as important to the evolving information society—analysis and critical thinking, organizational and reference skills, creativity, and the ability to communicate interpersonally and internationally—call for general training in addition to specialized training. The former should form a foundation for the latter. Therefore, the core curriculum that is designed to provide this general foundation should be emphasized in the formative elementary and secondary years and protected from encroachment by peripheral studies. Proficiency in math and science is important for all students, but different levels of proficiency are needed in a technological society. While all students need to understand basic concepts in math and science to participate in modern life, a certain highly skilled cadre of students requires special advanced programs to become technological innovators.

At the 1983 National Association of Secondary School Principals'

Annual Convention, Ernest L. Boyer, president of the Carnegie Foundation for the Advancement of Teaching, urged that high schools develop two kinds of mathematics curricula, one for general-education students and another for students interested in pursuing advanced studies in the two fields. Since not all high schools will be able to offer the needed advanced training, Boyer recommends a "network of residential math-science academies" to be established across the nation.

Yet increased training in math and science in isolation will not make students better manipulators of technology. Michael Kirst and Michael Leonard of Stanford University recently noted that "the skills needed to use the new technology are not a new and specialized branch of knowledge. Rather, they involve the same old skills of comprehension and logic that can be learned just as well in good English, history, or art courses as in good mathematics and science courses."

Conclusion

The 1980s seem to represent a crossroads in the United States for economic development, technological advancement, and educational support. Simultaneously we are witnessing a decline in economic growth, the loss of our position of technological superiority to other nations, and the denigration of public education. The interrelationship of these three indicators suggests the need for a clarification of priorities.

The preceding analysis leads to the conclusion that education has much to contribute to both economic growth and the utilization of technology. It is important to remember, however, that education is not the only contributor to these factors and that, concerning the productivity of the economy in particular, diverse forces are at work that are not significantly influenced by the educational system. Yet educational planners can take steps to ensure that the system is responding to the needs of a changing world as well as fulfilling its traditional functions.

Educators can join with representatives of diverse fields—business and industry, the social sciences, the fine arts, government, science and mathematics—to define the skills most needed and most lacking in the workplace. The material covered in this paper indicates that the basic skills imparted by a more liberal education are more important than job-specific skills and that, beyond the basic skills, students need better instruction in higher-level reading and math skills and in critical thinking and analysis.

Changes in the focus of the curriculum will require adjustments in teacher preparation and inservice education. As Stuart Rosenfeld has observed, "the ways in which basic skills are taught affects the creativity and aspirations of youth. A system that encourages inquiry and creativity helps produce the. . . leaders. . . who *create* jobs as well as fill them." This effort might entail extended inservice programs; in Pittsburgh, for example, high school teachers now may attend classes at a Teacher Center for a period of nine weeks.

A redefinition of curricular priorities should also initiate a careful examination of testing procedures. Lauren and Daniel Resnick have proposed replacing national aptitude tests with more frequent exams on specific course content. In a recent report from the National Council of Teachers of English, *Secondary School Reading: What Research Reveals for the Classroom*, the authors stress the importance of teaching students how

to read from books. They cite the overuse of multiple-choice tests as a primary reason for the decline in higher-level reading skills. Once schools have identified the skills they will emphasize, they must not only provide the necessary instruction, but also ensure that student tests in fact measure the skills being taught.

Sociotechnological reforms in the workplace will also have important consequences for educational institutions, as Levin and Rumberger have predicted. The movement toward greater worker participation in planning and decision-making, collaborative work teams, self-management, and shared responsibility demands skills in communication, self-motivation, rapid decision-making, and flexibility. As E. F. Schumacher has suggested, these, too, should be part of the curriculum.

Of paramount importance in concentrating on individual productivity is maintaining a sense of balance. Education should not be harnessed to the demands of the economy and thereby exclude other facets of development. We must keep in mind the growth of the whole student while encouraging the acquisition of specific skills. The evidence examined here suggests that society may be best served by training students in a basic curriculum to develop skills that are applicable to all human work in addition to providing opportunities for specialization. If schools offer guidance in choosing among options, nurture curiosity, foster the ability to adapt to change, and build the capacity to deal with disequalibria, a better prepared, more flexible work force is sure to emerge. The trick will be to focus the kaleidoscope on one cohesive and rational pattern.

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